

INSECT LIFE
ITS WHY & WHEREFORE



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INSECT LIFE

ITS WHY AND WHEREFORE

BY

REV. HUBERT G. STANLEY

(FELLOW OF THE ENTOMOLOGICAL
SOCIETY OF LONDON)

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WINIFRED M. A. BROOKE

LONDON: SIR ISAAC PITMAN & SONS, LTD.
No. 1 AMEN CORNER, E.C. . . . 1913

PRINTED BY SIR ISAAC PITMAN
& SONS, LTD., LONDON, BATH,
AND NEW YORK . . . 1913

INTRODUCTION

HAVING from time to time written articles on insect life for journals and lectured upon the lives and habits of various small creatures, I have been struck with the great interest shown by the public, and this despite the very large number of books already published upon such subjects. A recent investigation among the shelves of one of our largest libraries has opened my eyes as to the reason of so much ignorance existing, with such a mass of knowledge obtainable. It is that so many entomological experts use terms which are totally incomprehensible to the uninitiated, while, on the other hand, some of the most pleasing little books upon the subject are written for children, in childish language, or mixed up with a mass of information upon trees, flowers, shrubs, etc., etc. I am venturing in these brief pages to place in the hands of farmers, gardeners and others interested, a few straightforward facts, couched in simple,

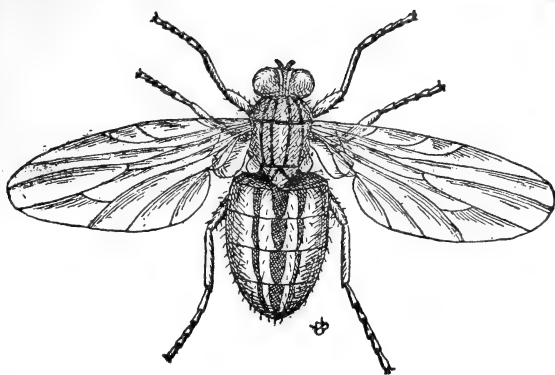
everyday language. Except in a very general way all remedies for pests are unmentioned—nobody's patents being brought before the public—the desire being simply to spread knowledge and, I trust, even affectionate respect for some of these wonderful little treasures which surround us on all sides. The simple illustrations may be imperfect microscopically, but they are only intended to help in the identification of each creature of which mention is made. The actual size of the insect is indicated by the scale given at the side of each illustration.

H. G. S.

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THE HOUSE FLY

INSECT LIFE

ITS WHY AND WHEREFORE

THE HOUSE FLY

EVERYTHING, without exception, has its use—even the house fly. Yes, most people reply, no doubt it is sent to try our patience. The one comfort vouchsafed to us by the advent of the cold, dreary days of winter is, according to some, “There are no flies to worry us.” First, let us be sure of our ground. We are going to think for a few moments about the house fly and just dismiss with but a slight comment its many cousins.

More than one species of fly enters our houses. The proper scientific name of the

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house fly is "*Musca domestica*," a medium sized greyish fly, the mouth-piece of which consists of a trunk or proboscis, terminated by a sucker, composed of two tubes, by which it is enabled to suck up fluid substances. This proboscis is capable of being entirely withdrawn within the cavity of the mouth, when the insect is not feeding. This tongue, from its formation, is incapable of penetrating the skin, though provided with a terminal framework of tracheal tubes which, acting like a rasp, enable the insect to worry us with a tickling sensation, but it is quite unable to bite.

There is another fly which is very fond of entering our houses, and which, none, probably, but an expert, would detect as differing from the house fly in appearance. This gentleman possesses the name of "*Stomoxys Calcitrans*," but from a point of view other than his mere exterior he differs very materially from the "*Musca domestica*" in that his mouth parts are formed for the very purpose of piercing the skin. Just as the house fly is common to nearly every part of the world, so his

objectionable relative is most catholic in his travelling propensities.

A third species, commonly known as the cluster fly (" *Pollenia rudis* "), frequently pays us a call, more particularly towards the close of the year. It is a little larger than the house fly, with a dark coloured, smooth abdomen and a sprinkling of yellowish hairs. It is not so active as the house fly, and towards winter becomes very sluggish in its movements. At such times it may be readily picked up, and is very subject to a fungus disease common among flies, and is not infrequently seen dead upon the window panes.

There is again the "*Muscina stabulans*," a species of stable fly, and various types of flies which possess metallic colouring of green or blue, the greatest of which in point of view of size and probably of frequency in visiting us, is the "*Calliphora erythrocephala*," or blow fly, which has a number of pet names with us such as the bottle fly or the meat fly, applied to it from its tendency to breed in all manner of decaying animal matter. In fact, few people except entomologists have any idea

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of the mixed company that exists in a houseful of flies, but as the house fly predominates largely in numbers, and as our article has to do with this one species of fly, we will proceed to discuss his peculiarities.

HIS HAUNTS.—The “*Musca domestica*” commonly lays its eggs on horse manure, as this substance seems to be the favourite food of the larva; it will also oviposit on cow dung or in excrement of every kind, and if such be not available, it will breed in decaying animal or vegetable substances of any nature—even in slops and fermenting liquid matter. The eggs are minute, elongated ovals of a dull chalky white, each female laying an average of 120 at a time. These eggs hatch in about eight hours. The larval period, *i.e.*, the time when it assumes the form of a tiny maggot, lasts five days, after which time the pupal or chrysalis form is reached, which after another five days produces the perfected fly.

The development of a generation thus takes about ten days. This period is to a certain degree dependent upon the surrounding temperature, etc. Recent

investigations have proved that the larvæ or maggots moult twice, showing that there are three distinct larval stages (the term moult means here the casting of the skin, a phenomenon peculiar to insects in the larval stage), so that we thus arrive at a rough house fly time table.

Egg from deposition $\frac{1}{3}$ of a day, say	..	8 hrs.
Hatching of larva to the first moult	..	1 day
From first to second moult	..	1 day
Second moult to pupation	3 days
Pupation to issuing of adult fly	..	5 days
		<hr/>
Total life round approximately	..	10 days

Now we see that there is time during an average summer for many generations to see light. Probably during the summer of 1911 quite twelve or fourteen. Is it any wonder with this enormous power of reproduction that this was known as a summer of flies?

Take the number of eggs laid by a single female house fly as averaging 120. There may be four such batches from one female, so that the huge numbers in which flies are found may be easily accounted for—200 puparia have been found in one single cubic inch of manure! It will not be a

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very severe tax on the mathematician to work out the number of house flies which one single female may be responsible for.

THE ENEMIES OF THE FLY.—These are fairly numerous and very diverse. Certain species of birds are extremely fond of this fly. There are also several forms of parasites which attack it. A small reddish mite frequently covers its body and in the end causes its death. The common house centipede destroys considerable numbers, as well as some species of beetles, which prey upon it. The vegetable world also supplies a most effective enemy in the shape of a fungus disease known as “*Empusa Muscæ*,” which carries off large numbers of house flies, especially towards the end of the summer, when they are constantly to be seen distended, and unable to move, as the internal growth gradually expands, the spores being observable around their victim.

SPREADING DISEASES.—That the house fly carries germs of disease can never for a moment be disputed. Typhoid may be spread by them as well as a large number of intestinal germ diseases, such as asiatic

cholera, dysentery, and infantile diarrhoea ; while germs of tuberculosis, anthrax, ophthalmia and small-pox have been found in the house fly.

How to be rid of them is a problem. No small fortune awaits the man who can rid a house of flies. Every device has been tried even to screening windows and doors but without much effect. "Fly cemeteries" and different kinds of sticky, uninviting looking papers and wires have been invented, but with very little result. During the winter of 1905 a French newspaper offered a reward of 10,000 francs for the best essay upon the destruction of the house fly, and the prize was awarded to one who suggested the use of a residuum oil, which was to be used in cesspools and in all places where there is an accumulation of filth. This it was suggested would form a covering of oil killing the existing larvæ and preventing the female fly from approaching to deposit her eggs. It was claimed, too, that it would cover excrement and hasten the development of what is known as anærobic bacteria as in a septic pit, which leads to the liquefaction of solid

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matters and so renders them unfit for the development of other bacteria.

Experiments in America have proved fairly successful where kerosene has been used for spraying manure and refuse, while in some parts of the U.S.A. the matter has been so seriously taken up that the health authorities have laid down rules with regard to stables and the depositories of all kinds of refuse and garbage ; all such places being made more or less airtight to prevent the ingress and egress of flies. Of fly traps we may say their name is legion. Much has been done by the U.S.A. Department of Agriculture, but flies there are and flies there will be until the whole country takes the matter up seriously.

ITS OBVIOUS MISSION.—The house fly may be a nuisance, it may be a menace to the health of the home. Would it find its place at all in the home, or at any rate in anything like such numbers if precautions as to cleanliness were more general ? The dirtier a house is or the dirtier the neighbourhood, there will you find the greater number of flies. Go into the cottage ill kept, ill ventilated, ill

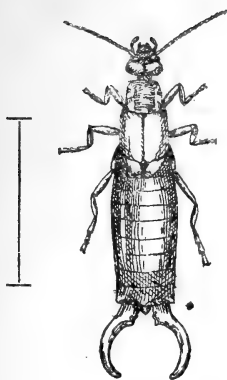
drained, with improper sanitary arrangements, pigsties close to the house, etc., etc., there you have the paradise of the fly. Badly kept streets, dirty farmyards, stable drains and manure heaps are the places where the fly abides. The unceasing attempt of the larvæ of the house fly to do our scavenging for us, when we fail to do it ourselves, is a silent but obvious reproof of the dirty habits of men. Nature in her kindness would show us that it is detrimental to man's health to have about him dead and decaying matter, excrements of animals, and all that is unsightly and impure—these minute heralds of the laws of sanitation, which man is so slow to learn, have been for ages at work. They are perhaps too small and too silent in their work for most men to observe, so the mature insect in the form of the fly comes buzzing in our ears and tries to wake us up in louder tones.

In crowded thoroughfares no nuisances, in the form of stables, or kennels, should be allowed which are not thoroughly treated with a preparation, capable of killing all larvæ, at least once a week. All manure

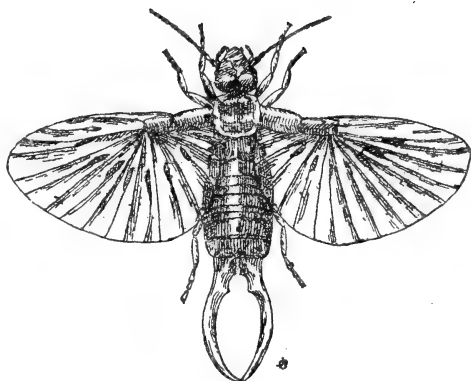
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should be removed regularly once a week, and where pets of any kind are kept all excrements should be burned or treated chemically. Where there is none of this decaying matter there will be no flies or very few of them. If every householder would begin by being very careful in this matter, we should soon find that the "*musca domestica*," and many other species of flies as well, would become more rare. An excellent maggot killer, which few can complain of the price of, is chloride of lime. If our friend the farmer, with his large heaps of manure, were to use this, or better still, be compelled to use it, a great service would be rendered to his fellow-men.

If that troublesome little insect, with its patience-provoking, unappetising habit of perching sometimes on my plate, sometimes on the end of my nose and anon in my eye, has succeeded in dinning into my dense mind that I must be cleanly in my habits if I would be healthy and strong—if it has succeeded in emphasising that cleanliness is nearly allied to godliness, then dare we any of us say that the fly has plagued us in vain ?



THE EARWIG



WITH WINGS OUTSTRETCHED

THE EARWIG

THE Earwig ("Forficula") and its life story is a case of give a dog a bad name, etc. It has a bad name in nearly every language of Europe, all suggestive of the dreadful things which every nursemaid, in every generation, has told her young charges this fearful creature will do when it has penetrated the human ear. Before proceeding any further with a description of the insect, shall we at once and for ever show how this fairy tale has got abroad and how absolutely untrue it is? The earwig is very fond of secreting itself in any likely cavity, and generally endeavours to reach the innermost recesses of such a cavity, and much exaggerated tales have been told of how the insect has found its

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way into the ears of people sleeping in the open air.

The slightest anatomical knowledge of the ear will prove conclusively that it is next to an impossibility for an insect of any kind to enter the ear proper, and perhaps least of all an insect constructed as the earwig is. Then, too, if an earwig entered the aural orifice for the very slightest distance, the peculiar secretion which is naturally placed there for the preservation of the ear is so very pronouncedly bitter that in all probability the insect would on coming in contact with it withdraw at a much greater rate than it entered. This whole idea is unworthy of perpetuation in these days of enlightenment. Earwigs in some form are found nearly all over the world. There are said to be upwards of 300 species. In warm countries and in cold countries there are earwigs to be found. Several species are found in Great Britain, of which only two are common, viz., "*Forficula Auricularia*" and the smaller "*Labia Minor*." The former of these, with which we are specially dealing, is common to all parts of Europe. Most

kinds are of varied shades of brown, yellow, or red. One species peculiar to South America is white.

MALE AND FEMALE.—Differences in the male and female are evident on close examination. In the male insect the forceps are more fully developed and the curious abdomen in the male insect has nine distinct segments, whereas in the female but seven are evident. The wings of the earwig are of exceptional beauty, and yet there are not a few people who do not know that they even possess wings. The wings are quite astonishingly large, very delicate, and fine, as you might almost guess when you examine the small tightly fitting case with which they are enveloped when packed away. The ordinary earwig of which we are speaking has very seldom been observed to make any use of its wings at all. The other common British species, "*Labia Minor*," is often seen on the wing and so not infrequently is mistaken for quite another insect. If you wish to examine the wings of an earwig and to verify what has been said of their beauty, when you have caught the insect

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and observed it closely, you will perceive two little spikes projecting from the wing covers in the back ; these are really portions of the wing.

Great difficulty is found always in making the earwig spread its wings voluntarily, but we can force the wing case open and disclose its wonderful contents by blowing smartly under the wing covers in the direction of the insect's head. When you have thoroughly examined these lovely gauze-like wings the first question that you will ask yourself is, How are they put back ? They have to be carefully folded and replaced. You do the insect no injury at all by causing it in the way described to disclose the wings, but you may do it infinite harm if you, with your clumsy fingers, attempt to assist in the refolding process. Simply watch. It will shake the wing into a number of perfect folds. Then come into play what many ignorantly describe as its terrible pincers or forceps. By means of these forceps, which it uses almost as fingers and thumbs, it seems to take out the plaits and smoothes out the creases, refolds the wings and pushes them

back into the covers. The wing-covers, or elytra, are in the case of some foreign species of earwig very beautiful, having a bright, metallic lustre. These pincers are then primarily given to the insect as tools for folding the wings. They can be employed as weapons of offence or defence, though it is not easy to see that they can be of a very terrible nature when used for either purpose. If you pick up a well-developed earwig and cause it to use its pincers you will be in a position to gauge the use to which these can be put, and in any case it will drive away for ever any loathing begotten of fear which you may previously have experienced when the insect is near you.

DAMAGE TO GARDENS.—Yet another cause of dislike is the damage which they undoubtedly do in gardens and flower beds by gnawing the petal edges of certain flowers—notably dahlias. More especially is it noticeable in flowers the plants of which possess hollow stems. This troublesome trait in the earwig character may be much abated, if not obviated, by placing in the immediate vicinity of the flowers something

which the earwigs may run up into—an inverted flower pot with the hole in the bottom plugged by a stick which holds it in position, or by bamboo rods with slots cut for the insects to enter. The way in which the earwig accepts this alternative would rather suggest that the original idea in running up to the stem or spike of the flower thus damaged, was not for food purposes. Except for this damage among the flowers, which, as shown, can be easily prevented, surely of all insects ever looked upon, there are none more absolutely and perfectly harmless than the earwig.

The food of the earwig is not easy to define. If we are to believe the evidence of many naturalists upon the subject it is very varied indeed. Most certainly vegetable matter forms a large item in their diet, and they are sometimes to be seen attacking fruit that has fallen from the trees. But as they are so frequently to be found congregated under the bark of trees there can be little doubt that they consume the larvæ and pupæ of small insects—in fact there is evidence which cannot be disputed that they are carnivorous

at times, and have been even known to eat their own species. There is every probability that they make away with certain insects which would, if allowed to become too plentiful, be a pest. There are many insects, of which the wasp is a notable instance, which in the early part of its existence is carnivorous in its tastes, while, later, fruits of all kinds are preferred.

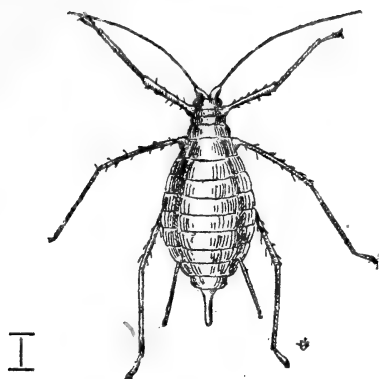
THE EGG.—The eggs of the insect may often be seen in the early warm days of springtime—sometimes under a loose stone, sometimes under an earth clod. These eggs, few in number, are, in proportion to the size of the insect, fairly large, and have been compared to small mustard seeds. The female earwig sits across them, so that she may thoroughly protect them, and unlike the majority of insects, which having deposited their eggs leave them to take care of themselves, she is perpetually on the alert for any marauder that may come along. Woe betide him whatever he may be, for on one side he will have to deal with a formidable pair of shears in the form of the insect's jaws, and on the other side with her hardly less formidable forceps.

For this purpose, and evidently, from the position she takes up, not for the purpose of imparting warmth, does she brood over her eggs. It is rather the thorax of the insect than the abdomen which she rests upon them. Although judging from the way in which the earwig usually rushes from cover to cover, it has a distinct dislike to the light, you may expose a female earwig to the full rays of the sun and it will retain its position of defence.

MATERNAL INSTINCTS.—One of the splendid characteristics of the earwig is its remarkable maternal instincts—for not only does she so marvellously tend her eggs, but she most carefully looks after her newly-hatched young, for we have to bear in mind that they differ from some of the insect families to which they are closely allied, in that their pupæ are active—that is to say, that when hatched out, the baby earwig closely resembles the mature insect, except in possessing only rudimentary wings, etc. These tender little broods need careful guidance and protection, and no mother ever nursed her young with greater patience and solicitude than does

mother earwig. When we look upon the great human race, the climax of creation, we see evidences, the world over, especially demonstrated as he has emerged but little from his barbaric state, of the utter indifference with which he often regards child life. When we hear so constantly the admonitions given by justices in law courts even in our own country with regard to the hideous unnaturalness which many mothers display in dealing with tender infants ; when we look at the huge institutions, dotted everywhere, which have been erected for the protection and rearing of the helpless outcasts from loveless homes and loveless hearts, shall we still continue to look with loathing upon an insect which rises up against this generation and condemns it, by proving to us that small, insignificant, helpless as it is, the earwig still perpetuates the most natural, the most beautiful of all instincts—the love of a mother to her offspring. A great man once said that he felt always that he must remove the covering from his head when he witnessed the most sacred of sights, a woman nursing her babe. If you will not

remove anything from outside your head when you next meet with Mrs. Earwig, perhaps these few words may induce you to remove something from inside. That something is blind prejudice.



THE APHIS

THE BLIGHT FLY

THE Blight Fly, or aphid, is probably all too well known by any readers who may have gardens. If you have had any experience of hop gardens you will be better acquainted still, but any ordinary flower culture, especially, perhaps, that of roses, will be sufficient basis for a little thought and a little talk upon this minute weird visitor. In some cases the buds are entirely hidden with aphides. The harm done to vegetable life by these insects is enormous. Just imagine—millions of them on a single shoot, and each individual provided with a long sucker which is deeply plunged into the plant attacked, and by which means the nutritious juices—the very life blood of the plant—is drawn

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out, a process which ends in the mutilation of the flower bud and makes the plant both look and feel to the touch dirty and unpleasant.

Honey-dew, which most of us have heard of, and also seen, is caused by aphides. On many trees, but especially perhaps upon the lime tree, may this sugary deposit be seen. These insects crowd themselves upon the tree and set to work to suck its juices. These juices then become in some mysterious way transmuted within the body of the aphid into a sweet syrup, which then exudes from its body through little tubes situate on the upper part of the abdomen. Quite a moderately powerful magnifying glass will show you, if you care to pluck a leaf so covered, these tubes at work. The result upon the tree is not a pleasant one. The leaves have a dark varnished glaze upon them and are very sticky and unpleasant to the touch, and when this sweet-producing work is in full progress the tree becomes the rendezvous of nearly every species of sweet-loving insect that can either fly or crawl upwards, even including the honey bee.

The ant is especially fond of honey dew and is often to be seen licking the sweet exudation from the aphids ere it has time even to drop. Probably this fact has given rise to one of the many fairy tales regarding blight flies, one being that the ant uses them as cows, and feeds and tends them, etc. No actual proof of this statement has yet been discoverable, except the foregoing statement that they suck the honey-dew from the aphids. The aphides are certainly the subjects of extraordinary attention on the part of the ants. As before mentioned, the two little ducts connected with a glandular structure secrete a sweet saccharine matter of which ants are particularly fond, and the way in which the ants greedily suck up this syrup gives the idea of almost milking the aphids. The antennæ of the ants seem to be the media of intercourse between the aphides and themselves. It is thought by some that a pleasant sensation of tickling is produced in this way, as it seems from observation as if the touching of the aphids by the antennæ of the ant synchronises with the exudation of the sweet fluid from the

ducts. This drop is instantly seized upon and consumed by the ant, and in this way the process of a kind of milking goes on until the ant has been satisfied. The aphides themselves seem quite contented with the process, and surrender voluntarily.

It has, however, been stated that ants retain certain aphides within their nests, and use them there for this milking purpose, much as we keep cows or goats. It may be remarked that ants keep company with other insects which could not possibly be used in this way. For instance, woodlice are found in their nests not infrequently, and in other countries other species of ants are found entertaining other equally curious guests. The presence of aphides in an ants' nest has been accounted for in other ways, one being that as many fall and are blown from the leaves on which they are feeding they, in their sluggish manner, creep along the ground, and some of them eventually find their way in at the door of a hospitably inclined ant colony.

Another theory is that they go there to hibernate, as some living through the winter require a suitable temperature, and

find it there, as it is asserted that the aphides, on whose saccharine secretion ants chiefly subsist in inclement weather, become torpid at exactly the same low temperature as the ants themselves. Again, it must be pointed out that the aphides secrete this sweetened fluid as a result of sucking the juices from trees and shrubs, and it is as difficult to believe that ants could continue to feed these insects with food necessary for the secretion of these juices, as it is to believe that the insect could secrete anything when not in receipt of any food at all. The whole idea is very pretty, but needs substantiation before it can be chronicled as fact.

What a lot of attempts you have made, probably, to remove that unsightly mass from some of the shoots on your rambler roses. You have passed that delicate bud between your forefinger and thumb. You have tried washing them off with water. You have even requisitioned a fine brush and tried to do away with the objectionable little colony, and yet there are a few left, and perhaps when you looked again in a few days' time, lo

and behold, they were there thicker than ever. They are as the sand which is upon the sea shore in multitude, and when one comes to consider their rate of increase one marvels that all things living are not completely enveloped. Most insects go through the progressive stages of larvæ and pupæ. That is to say, they lay eggs which hatch into some kind of worm or maggot; these in their turn are formed into some kind of chrysalis, out of which the fully developed insect emerges, but aphides do not waste all this time, and, worse luck, can produce young either from the egg, or alive and ready for business at once. They are produced by either oviparous or viviparous generation.

Though it has yet to be proved that the same species of insect produces young in both forms, in any case without dealing in a simple article like this with so difficult and scientific a subject as what is called "parthogenesis," it is enough for us who are fond of flowers to know that one single blight fly may produce numbers of broods in one single summer, and that one individual aphis on a leaf or bud will cover

the whole of it with its progeny in the course of two days. A rough computation made has shown that a single aphid may in one year become the progenitrix of an offspring which would, if counted, many times equal in number the total human population of the world, which illustrates at a glance that their numbers in a single garden are quite past finding out. By far the greater number of aphides are wingless, while some again possess large wings.

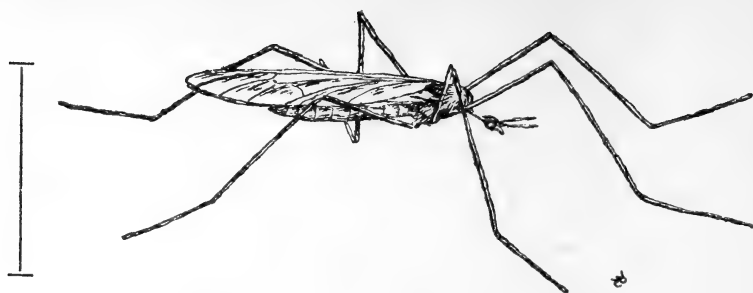
Probably this fact has given rise to the notion which many have, that nearly all aphides are of the female sex. It is quite possible that a large number are more or less abortive or imperfect females, which phenomena we have interesting examples of in the worker bees and wasps, which have, curiously, only the power, and that a very limited one, of producing males, and males only, under certain circumstances. Numberless are the remedies tried to reduce these insects in number—tobacco, soapsuds, quassia, and untold quantities of other nameless mixtures—but without much effect. There is but one real remedy, and that is Nature.

At the present the nuisance of blight is increasing year by year. Of that there is no doubt whatever. The order has gone out from many an officious local committee that wasps' nests are to be destroyed—when Nature sent us wasps on purpose to counteract this evil of blight. Nature will do much more than preserve her own balance if left alone, but when man begins to interfere, then the consequences he must reap. Some months ago a gardener pointed out to me a hover fly, and told me that he did not like to see them in the garden, as they were, he believed, the cause of blight, and if only he could find a solution of some kind wherewith to syringe his trees, he would keep them off. Poor man ! keep off his greatest friend—a ceaseless antagonist of the aphid.

The ladybird is still regarded by a good many with suspicion, and even with dislike. What would our hop gardens be without them ? Where would our rosebuds be ? I would like to see ladybird nurseries, where they might be reared and propagated. We have not half enough of them in many parts of this country. When

we have ceased to kill off birds, that the ignorant, superstitious tales have pronounced to be destructive in gardens and fields, when men have studied insects more, and found out the hideous mistakes they are making—then, perhaps bounteous Nature will prove even more bounteous still, and these little drawbacks to horticulture and agriculture will remedy themselves.

The blight fly helps me to understand that there are higher things at stake even than the mutilation of my rose garden. This study, if carried further, will help to increase the great corn harvest of the world, and the food supply of man. We are the workmen, the agents employed to help in the running of the world's vast mechanism, but we are not the Master Mind which conceived the whole, and when we try to manipulate its numberless springs and cogs, lest we wreck the whole, the life story of the aphid whispers, Hands off !



CRANE-FLY (DADDY-LONG-LEGS)



"LEATHER-JACKET"

THE DADDY-LONG-LEGS

THE Daddy-Long-Legs, or Crane Fly "*(Tipula Oleracea,)*", has at least sufficiently interested the inhabitants of this country, as to gain for itself a kind of pet nickname. To many it comes under the class of "horrid," as an accommodating, elastic kind of term applied to all insect life, while many others simply regard it as a curious, harmless, useless kind of being, and think no more about it. It is not peculiar to Great Britain nor confined to a single species. In some kinds there are varied characteristics observable. The legs of the male are longer sometimes than those of the female. In certain cases the antennæ of the males are

more than double as long as the body. This lengthening is brought about, curiously, by the reduction of the number of joints, six long ones giving greater length than the sixteen short ones of the female. The females are a little larger in the species which we know best, being about one inch in length, with a wing spread of about two inches, while the male is not quite so ample in its proportions. There are vastly more males than females to be found everywhere. The daddy-long-legs is generally of a dullish brown colour, with a slightly greyish stripe across its back.

The female deposits her eggs in or near grass, generally choosing a wet place, and the curious way in which the process is accomplished, perhaps, strengthens the idea which some people have, that the loss of a leg now and again is no serious calamity. Many a child will remember having caught one of these curious little creatures, and without the least intention of being anything but kindly disposed, has found that the struggling insect has left behind it one or more legs. When the female sets to work seriously to lay her

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eggs, she may be seen moving about in an almost undignified manner with only her third pair of legs and the end of her body dragging on the ground, her two front pairs of legs being up in the air, while she every now and again deposits an egg. She will probably drop upwards of 300 eggs. These are of a shiny black hue, and conical in shape. This egg laying process takes place again in the autumn.

The hatching will begin in about a fortnight, and the grubs remain in the ground during the winter. This grub is apodal, *i.e.*, has no legs or feet, and bores its way into the earth by alternately expanding and contracting, and is provided with very powerful jaws, these it uses upon the underground roots, which it attacks with great voracity. When full grown it is about an inch long, of a dirty greyish colour. These grubs are sometimes called "leather-jackets" because of the toughness of their skin. That they are fairly plentiful in many places may be gathered from the fact that over 200 have been discovered in a square foot of ground. There is hardly anything

that they will not attack that grows in the field or garden—hence the intense dislike that is felt towards them by the gardener or farmer. Yet how strange it seems that so many do not even to-day know anything of the connection between the “leather jacket” and “the daddy-long-legs.” These grubs, which during the winter confined their attention to the roots, work their way upwards in the spring, and begin upon the stems and surface vegetation, and in the course of the summer increase in size, till they attain a length of from an inch to an inch and a half.

Towards the end of the summer it attains its pupal or chrysalis state. The pupæ are provided with spines directed backwards, by which they can raise themselves above ground level, and the insect in this chrysalis form may often be seen sticking half-way out of the ground. The case in which the insect is enclosed splits in due time, and out of it comes Mr. Daddy-Long-Legs, equipped with long legs and long wings, ready to fly about and enjoy himself, and to prepare to enact this

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programme over again as the autumn chill warns him that time, like himself, has wings. I am afraid that next time you look at Mr. Daddy-Long-Legs after reading this you will not feel that he is quite as innocent as he looks, and you will think of his wicked offspring, the leather-jackets.

There is no cloaking or veiling the mischief these grubs do. As I write I have before me reports of havoc wrought among fields of corn, grass, clover, sanfoin, peas, beans, etc., etc., besides numberless valuable garden crops. Many acres of rich pasture land have been hopelessly ruined by these little tyrants, sometimes in low-lying country appearing in places in such myriads as to do damage that one can only compare to that done by a plague of locusts, except that they confine themselves to that which they can get at in close proximity to the soil. These little grubs are not much affected by intense cold, for when hard frost takes hold of the surface of the ground, they only go further down. Possibly, of the daddy-long-legs itself, in natural form, we shall learn more with the

advance of science. The long antennæ and the prodigiously long noses were certainly not uselessly given, and perhaps one day we shall be startled at finding some great hidden use.

In the meantime let us consider these mischievous little grubs with their tough skins and ceaselessly working jaws. About twelve months ago a certain London paper which has a considerable circulation, contained an article on agriculture, and especially dwelt upon birds as an aid or a hindrance to its development, and mentioned seriously that a meeting of farmers and those interested in the subject had been held in one of our eastern counties, when it had been decided that there were too many rooks and starlings, and that they must be reduced in numbers or the crops would suffer badly ! Now rooks and starlings are the known enemies of these little "leather-jackets" and feed to a great extent upon them. In fact, as shown before, they are unaffected by frost, as they only burrow more deeply, while in mild weather, the beaks of these birds are able to reach them. If farmers decide to do

away with their prime friends and helpers, Mr. and Mrs. Daddy-Long-Legs will have the country to themselves, and all our farming operations will be in vain ; and in these days, when there is an outcry for more ploughing and more general tilling of the soil, we shall surely need a proportionate increase of these helpmates in the form of birds. And we also at the same time recognise that the birds are drawn by the presence in such quantities of the progeny of the daddy-long-legs to destroy other grubs, which in proportion to their size and number are still more dangerous. Another way of getting rid of these destructive grubs is by deep ploughing, and so burying the eggs, which, if the soil lies heavy upon, will be unable to hatch.

In some parts where this pest is less common flocks of sheep are driven over the spots where the insects are known to breed, in order to harden the soil and thus hinder development.

Those of us who are interested in farming operations know that there is ploughing and ploughing. One ploughman seems to do little but scratch the surface of the

ground, while another drives the share in very deeply. The latter does the ground most good, obviously, by turning up fresh soil, by giving a greater depth of soil, and by turning well under anything in the nature of weeds which may be growing upon the surface. He, too, does more destruction of the young daddy-long-legs' hopefuls. He can not only destroy eggs, but he gives the birds a better chance with the grubs, and should frost set in soon after the deep furrow has been worked, it can, of course, get down to a much greater depth and work much more effectually than if the ground had either not been ploughed or only badly ploughed. Deep ploughing is a magnificent antidote to leather-jackets.

There are a number of dressings for the land which all in their turn are good—some more, some less. Lime, especially some kinds of gas lime, nitrate of soda, soot, common salt, etc. Now as scientific farming grows in fashion, so does the number of dressings used grow apace, and these mentioned as antidotes to grubs are all good for the land in their different ways. Take the case of lime. What a

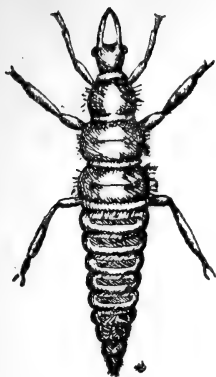
quantity of it is used in wet clay lands. One expert, only last year, canvassed a district where much of the land is of this nature, and advocated to everybody the use of lime, until hundreds of tons were used, where little or none had been tried before. This was in order to benefit the land itself and its dependent crops. Yet this is the very kind of land in which the embryo daddy-long-legs dwells and flourishes. So that again, as in the case of the ploughing, just what is needed to kill these off, is the very remedy which is needed to counteract certain harmful points in the nature of the soil itself, and to bring forth from it by methods of combination all that is best.

Yet one other point in the eradication of the grub is the proper draining of marshy and damp ground. Ask the medical man, ask any man with an iota of scientific knowledge about the harmful result of boggy places, especially during summer time, and he will tell you that these spots are the nurseries of all sorts of evils to which the flesh is heir. Ditches, dykes, and ponds should all be cleaned out, and damp

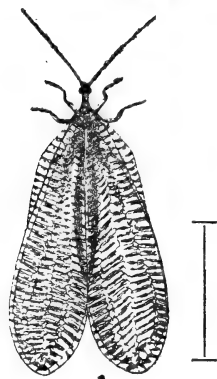
spots drained, and their millions of tenants evicted. What the swamps of Western Africa and South America represent in fevers, and insect terrors, so in a minor degree do our undrained spots at home spell whole hosts of evils which might be done away, including the propagation of that unwelcome alien, the mosquito. What a lot of land that is now waste—too wet to be of any use—might be again utilised if properly drained. How many a desert might blossom as the rose, much to the profit of the owner and the discomfiture of Mrs. Daddy-Long-Legs, who will have to move on; and where she is not, her hungry little offspring will be absent. Look at the facts fairly and squarely, so that baneful as is this destructive nuisance, the very things necessary for its destruction are the identical things that are necessary for successful tillage of the ground. If it does enjoy its little life for a short space in a way that is inimical apparently to the best interests of man, yet in a way it seems to immolate its little form on the altar of science, by reminding us, If you wish to

destroy me, protect those birds that are my enemies, plough your land deeply and bury me. Do not spare good natural manures though they are my death. Drain your land. No matter that there will be no place for my species to continue; I die, but your land will be more productive and more valuable.

There is one relative of our old familiar friend that possesses a very peculiar trait—the grub is able to remain at the bottom of a sheet of water while it thrusts its very long tail to the surface to act as a breathing apparatus. When it reaches the pupal state this useful bronchial appendage is quite done away with, but instead of it another, quite as long, sprouts out at the other end. Many queer habits and customs belong to the great daddy-long-legs race in different parts, as with the varied branches of the great human family. There is an old Italian proverb, “*Sempre il mal non viene per nuocere*”—a broad interpretation of which is, what is to us as an apparent ill does not always come to do us harm. Perhaps this is somewhat true of the naughty offshoots of dear old Daddy.



LARVA OF LACE WING FLY



LACE WING FLY

THE LACE WING FLY

THE Lace Wing Fly ("Hemerobiidæ") is a useful insect which is not regarded with any sort of disgust by most men, but at the same time very few understand its great value in the garden, or pay it the respect which undoubtedly is its due. It ranks among the greatest of great aphids destroyers, and as such should be ever welcomed among the visitors to our flower gardens. To some few it is known, from the brilliancy of its eye, as the "Golden Eye." As a matter of fact, quite apart from its useful properties, it ought to attract all who have any regard for beauty by its lovely construction. The wings of this fly are large and iridescent, and so magnificently transparent that the whole

outline of the body can be seen through them when they are at rest. The body is slender and delicate in its proportions, and of a pleasing light green colour, while the eyes sparkle with a beautiful lustrous gold tint. It is an example of one of those beautiful insects, the colouring of which it has surpassed the cunning of man to retain. Just as men have failed to preserve the colours of some of the more beautiful dragon flies, so they have been at a loss here. While the wings keep something of their lustre, the beauteous gold of the eye fades out, and the body changes its colour.

A MEANS OF DEFENCE.—The lace wing fly is no prime favourite with the collector of moths, perhaps partly for this reason, the difficulty of preservation, but the experienced hunter of varieties will afford you another stranger reason still why he dislikes catching the lace wing. It will when caught give out a most peculiarly offensive odour, and one which sticks. If you have ever handled one of these little insects and then smelled your fingers, you will not forget it. The tenacious

pungency of this odour one can only compare in a lesser degree with that sometimes given off by certain species of snakes. In all probability this is its means of defence, as the lace wing is so very delicate an insect in every way that it would otherwise be a hopelessly easy prey to everything which attacked it. On summer evenings the lace wing is to be seen plentifully in the field and the garden, flying from place to place, and is generally pretty easily captured.

HOW THE EGGS ARE DEPOSITED.—The curious way in which the eggs of this fly are deposited must have at some time attracted the notice of the observant, even though they were entirely ignorant of the fact that the lace wing had anything to do with the process. You may have observed certain leaves occasionally, or even tender stalks, with fine, slender filaments attached to their edges, and these filaments have a little ball or knob at the ends like fine rows of tassels hanging down. The knob-like ends of these threads are the eggs of the lace wing fly. These in time hatch out, and after their little

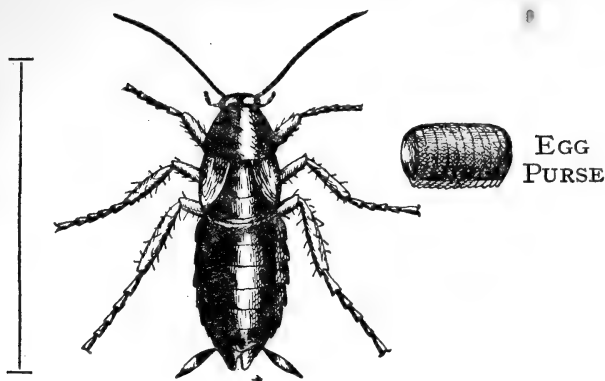
tenants have gone the filaments look uncommonly like some vegetable parasite or moss attached to the leaves, so much so that many people have been quite deceived. The method by which the whole process is worked is as wonderful as the result. Taking up her position upon a satisfactory leaf—never, be it remarked, far from the habitat of the aphis—she drops upon the edge of this leaf a tiny particle of sticky, glutinous matter, which she proceeds to draw out like a fine thread until of a suitable length. This substance very soon dries and hardens, when it comes into contact with the air, but ere the thread has had time to go through this process an egg is deposited and attached to its extremity. It is these little whitish-coloured eggs attached to these threads which form the curious fringe-like appendage to the leaves.

In addition to the peculiar and offensive odour emitted by the lace wing, she has another means, in common with so many other creatures, for protecting herself, and that is her adaptation to local colouring. As the pheasant is hard to distinguish

in its background of bracken and dead leaves, or the grouse moving amidst the heather, so while in the evening time the lace wing may be seen flying, it is not so easy at first sight to discover it in the daytime, as it attaches itself most frequently to the back of green leaves, where the green of its own body and the thin filmy transparency of its wings render it difficult of discovery.

FRIENDS, NOT ENEMIES.—The grubs of this fly resemble somewhat lengthy maggots, the tails of which are blunt, and it is with this maggot that we are most concerned when we speak of the great use of the lace wing. It is the progeny of this fly that is so helpful to the gardener. It has an insatiable appetite, and its food consists of blight flies, and from the onslaughts which it makes upon aphides the grub has earned for itself the popular name of “the Aphis Lion,” and herein lies the great advantage of educating every gardener in the rudiments of entomology, as well as horticulture. I came across a provincial paper recently with an article by a “horticultural specialist,” giving an

illustration of the lace wing fly as one of our many garden pests! Not once, but many hundreds of times, have gardeners discovered one of these intrepid hunters slaying aphides right and left, and just for want of a little knowledge he has slain his friend and merely thought of it as another of those countless "enemies" who are always coming to spoil his best results and mar his reputation—and has in so doing underlined again that truest of true sayings, "Evil is wrought by want of thought rather than want of heart." So often in this world things are compensated and balanced in their attractiveness. One thing is beautiful, perhaps, and another thing is useful. But here in the lace wing fly you have one of the most beautiful of British insects—an egg carrier which in itself is unsurpassable as a work of art, and larvæ which in their utility are worth many times their weight in gold.



THE COCKROACH

THE COCKROACH

THE Cockroach ("Blattidæ") belongs to the order of orthoptera (locusts, crickets, etc.). These insects are somewhat handicapped in life, in that they are regarded as obnoxious by nearly every member of the human race. A description of them is hardly needed, they are so well known. The body is flattened in shape and they possess long, fine antennæ. The male insect in its mature state is provided with a pair of membranous wings protected by well-developed wing covers. Probably few, if any, have ever yet seen these wings in use.

The female has wing covers in a rudimentary form only, and no true wings. The eggs laid by the female are generally

sixteen in number and are deposited in a leathery capsule or case, oblong in shape, which she carries about with her, fixed, with a glue-like substance, to the abdomen. This little purse of treasure she faithfully carries, for the sake alike of warmth and security, until the hardened leather-like substance at the correct time is softened by a fluid which she emits, and the young larvæ emerge ready to play their part in making history. Not of the same colour as their devoted parent, but of a creamy whitish hue. In shape and form they are very like the mature insect, but do not attain their correct colour and strength until they have cast their skins some six times. The cockroach is not a native of this country, and was originally introduced from Asia and the Levant, having probably made its way hither in the cargoes of vessels. Like many other aliens, it has found the climatic and possibly other conditions suit here, and it has waxed fat and prospered. If you have ever noticed cockroaches on board ship they are often much smaller than those which are already naturalised here. In fact the

“*Blatta Orientalis*,” or common cockroach, was not originally found in any part of Europe, while now it is to be found in most parts. The familiar cockroach has some very formidable relatives that are less popular even than himself.

The “*Blatta Americana*,” which not infrequently comes over from America in ships trading with that country, especially in grain, is much larger in size, and is frequently to be met with in comfortable quarters on this side. He is very kindly disposed to those places where there is plenty of warmth, such as bakehouses, hotel kitchens, etc. Then there is one other kind which is worthy of mention—the Great Cockroach, or “*Blatta Gigantica*”—sometimes called “the Drummer,” because of his peculiarity in tapping or drumming on woodwork—a noise which, when made by a number of workers in unison, is quite irritating and disturbing, and is as loud at times as the noise made by a rat which has found a lodging beneath the floor or behind the wood-work of a room. This insect attains a length of two inches, with a wing spread of three inches. Cockroaches

love the hours of darkness, and do not generally issue forth until the light has been extinguished, when they seem to move about with very great activity, being able, apparently, either to mount a wall or flat surface, or to career about on the ground at a great rate. As to their food, they are ready for anything and everything, being proverbially voracious, and may be said to be truly omnivorous, devouring whatever comes in their way. Probably one of the reasons why they are so intensely unpopular is because what they do not actually consume they spoil by rendering it unfit for consumption. Those who have been in the haunts of the cockroach will not have a pleasurable recollection of the peculiar foetid odour which the insect seems to impart to everything which it comes into contact with, whether it may chance to be an article of food, wearing apparel, or possibly even a pair of old boots. Leather is frequently destroyed by them.

There is no doubt that the cockroach is a splendid scavenger, and probably in his native lands, where there is a noted

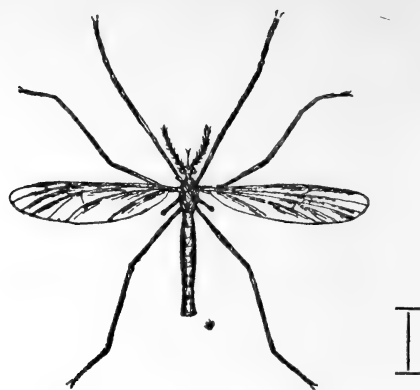
disregard of the laws of sanitation and cleanliness, he has an important part to play, for be it remembered that though an invasion by cockroaches may be made into any premises, yet it is an established fact that the dirtier, the less ventilated a house is, so much more is it liable to be frequented by these insects. Cockroaches will readily leave an untenanted house where there is neither warmth nor food, and have been seen migrating in a long, continuous stream from one house to another. One case was brought under my notice some years ago where, like a long, dark snake, the cockroaches were leaving an empty house in search of pastures new. Any chinks or hollows in the plastering behind wainscotting will form suitable apartments for the cockroach. Cleanliness, free use of paint, the filling up of all uneven places with cement, the use of disinfectants, will all help to keep down number, while if they form a very numerous colony they may be first reduced by means of a beetle trap, many kinds of which are available, the best being a circular one, where there is a small

receptacle for treacle, brown sugar, or beer. This is approached by a number of apparently sound metallic paths; each pathway, however, when the insect treads upon it turns over and precipitates it into a well beneath, from which owing to the slipperiness of its steep sides it is unable to escape. The most humane way to get rid of the contents is to empty it into a hole in the ground, and bury the cockroaches, or else, cruel as it sounds at first, empty them into a vessel of perfectly boiling water, or a strong solution of soda. Death is then merciful in that it is instantaneous. Having rid yourself of the major portion of the colony the methods mentioned above will cause the others to slowly and gradually disappear. Needless to say, all food, even to crumbs on the floor, all boots, and indeed everything that could possibly afford the least attraction should be always carefully put away every night.

I have found, personally, that a hedgehog is a most useful animal to keep in the house. They are easily tamed, and will become almost affectionate. If you can secure a young one and feed it with a little bread

soaked in milk, you will find that in the course of time it will uncoil itself and approach you when called. I had one once for some years, and lent it to anyone who was troubled with cockroaches. It simply needs to be shut in the room where you have any trouble, and when the shadows of night draw on it will commence operations. And you will not have to wait long before you discover that you have the best trap in the world. To those who live in districts where circumstances make it difficult to obtain a hedgehog, or get a patent trap, a piece of wood covered with coarse sugar or treacle floating in a broad dish of water will generally do its deadly work.

There is just one little favour I would ask before closing. Don't call cockroaches blackbeetles again. Why? Because, simply, they are not beetles at all! Neither are they by any means all black—in fact, the greater proportion of them, especially the smaller species, are brown.



THE GNAT

THE GNAT

THE Gnat is the popular name of a genus of insects—"Culicidae" (from the Latin "Culex," a gnat), belonging to the order of dipteral or two-winged insects, and consisting of about 150 known species, being found very nearly all the world over, even as far North as the Polar regions. The mouth parts of the insect are very complicated, being nearly half the length of its total size. The principal part of this organ forms a long proboscis, constructed, apparently, for the purpose of piercing the skin of animals and sucking their blood. This proboscis is provided with needle-like lancets, which are barbed at the tips. A view of this wondrous weapon, when highly magnified, causes one to cease marvelling

at the objectionable stab that so tiny an assailant is capable of dealing. But the subsequent irritation, which not infrequently causes swelling, is brought about not merely by the puncturing of the skin, but by a fluid which the insect simultaneously injects into the wounded spot.

UNWELCOME LADIES.—It is to the ladies of the gnat community that we are indebted for this unwelcome attention, for it is the female gnat that attacks, and not the male. When her favourite food (blood) is not obtainable she will turn her attention to sweet flowers. You will not have failed to notice frequently the dead gnats within the calyx of some large flowers. The male insect differs from the female in that it possesses much larger antennæ, which are also feathered. The peculiar humming noise made by the gnat is so noticeable as to bring about the name by which our commonest species is known—*culex* “pipiens.” This not unpleasant music is produced by the very rapid motion of the wings, which have been calculated to vibrate some 3,000 times in a minute.

The way in which the gnats congregate together in clouds or swarms is peculiar. Occasionally these swarms are of very huge dimensions, and are often composed entirely of females. The way in which this large body of these insects will move from place to place suggests almost a military leader or some preconcerted signal. The female deposits her eggs upon the surface of water, and as they are laid, packs them closely with her hind legs. So carefully are they fastened together that they form a kind of little raft or boat, which will not upset or collapse however much the surface of the water may be agitated. When ready to hatch, the larva emerges from the under side of the egg and simply drops into the water. The larvæ of the gnat are very active and swim with a peculiar jerky method. If you have round your house any tanks or barrels of rain-water, you must often have noticed the embryo gnat taking its exercise. It frequently comes to the surface to breathe, and the way it accomplishes this feat is quite one of the many curiosities of insect life. On arriving at the surface of

the water it suspends itself head downwards and takes in its necessary supply of air through a spiracle or breathing vent in one of the tubes into which the end of the body of the insect is sub-divided.

The pupal or chrysalis stage is hardly less interesting in its details, for even then the gnat as it approaches its last or perfect state is active. The pupæ are provided at the tail with a kind of paddle, by means of which they are able to propel themselves along, and also to suspend themselves near the surface of the water for the purpose of respiration, but now the breathing apparatus has undergone a change and it is no longer from the tail-end, but through two little inlets in the thorax, *i.e.*, the part of the body between the head and the abdomen. When the pupa casts its skin it does not cast it away, as do some insects, but makes another use of it. The perfected gnat as it emerges, uses the old shell or skin as another raft until it has had time to take in its surroundings, make its plans, and get its wings ready for flight. If you notice when looking into your rain-water receptacle

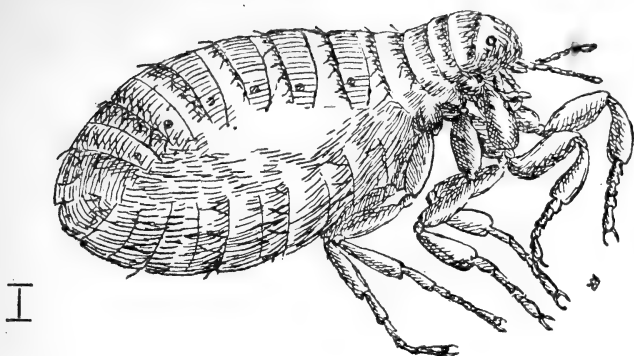
the myriads of these larvæ and pupæ as gnats going through their various stages of existence and also take into consideration what a very short space of time is occupied in the process, many, many generations of gnats are produced and perfected in the course of the year. We probably have to thank the swallow and other birds for reducing the numbers very considerably, or gnats at their ordinary rate of increase would make life something other than pleasurable during the summer months. Like many another insect it is very susceptible to climatic changes, sometimes flying high, sometimes almost skimming the ground. It is frequently observed that they are more virulent in their attacks on man when there is considerable atmospheric disturbance. The emptying of all unnecessary vessels of water and the draining of pools will help to rid a locality to a great extent of gnats. For though ubiquitous in its haunts, geographically speaking, the insect has special localities where it teems in greater quantities, these generally being in close proximity to a suitable breeding place. In reading these remarks, many will

see a close affinity between the gnat and the mosquito.

It is a fact that there is a very close relationship. The mosquito, which is so fearfully regarded by all who have made his acquaintance has many traits of character which are precisely those of the gnat, and belongs to the same species. The gnat apparently from all time has found a home in Great Britain, whereas the mosquito is, or rather was, a visitor, for he seems, like others who come from his part, to enjoy living under the British flag, and in many ways he is much more objectionable than his English cousins, in that he does his work singly and individually, and has no respect even for the sanctity of man's house.

One is as liable to be bitten by a mosquito when lying in bed as when walking along in the fields or garden. The hum of the mosquito is very high pitched and has upon some ears a most irritating effect. So poisonous is their bite or puncture, that the writer has seen cases where intense suffering and disfigurement has resulted from an attack by a single insect. Those little

clouds of gnats—each several insect a marvel of exquisite fragility, that even the clumsy touch of man will crush and destroy—how wonderful your construction ! —how unsurpassed the beauty of your wings ! You are a wee bit troublesome sometimes during the hot summer evenings, but when I look at your multitudinous numbers, I feel that things are not so bad but they might be worse. What if you were all mosquitos instead of gnats ?



THE FLEA

THE FLEA

THE Flea (*Pulex Irritans*) presents to us several problems, one of which you have probably felt. Having located him, how can I catch him? The scientist, too, has been much perplexed, being unable for a long time to decide which class or order of insects the flea belonged to properly. It is now generally held to belong to the "aphaniptera," or those possessing rudimentary wings. To some people—I do not refer to the respectable people reading this article—the flea is known very well by the sense of touch, but not so well by close inspection. The body of the insect is inclined to be oval in shape, and it is possessed of a hard, horny skin of a brilliant brown, or chestnut hue, and its head is rather small in proportion

to the size of its body. It has two small antennæ, or feelers. Its mouth parts are so formed as to give it a species of puncturing lancet, with which it is enabled to pierce the skin, causing blood to flow. This lancet is surrounded or covered by a proboscis, or suction tube, by which the insect draws up and feeds upon the blood. It has generally a healthy appetite, and in proportion to its size consumes very copious draughts of its favourite beverage.

If anyone has ever tried catching one, they will not have failed to perceive that its gymnastic powers are well developed, and that its means of evading your grasp are considerable. On close examination one rather puzzling characteristic is observable. In many forms of jumping beetles the hind femora, or thighs, are specially adapted for their peculiar means of progression. This does not seem to be the case with the flea, though the leg proper is made for that purpose. Its jumping powers are certainly most wonderful. It springs quite 200 times its own length, and at times exceeds this distance. Some notion of what this means may be

gleaned from this comparative illustration. If a man six feet high were able to jump with the same force as the flea he could take an upward spring three times the height of St. Paul's Cathedral. The muscular power of the flea is quite uncanny, and in all probability it is the observation of this strength that has been at the bottom of so many hundreds of those frauds which for long years have been carried on under the guise of a pretended taming of the flea. Not very long ago it was announced that a scientist had so subdued the mental and muscular forces of a flea that it allowed itself to be attached to a miniature coach ! and tales are current of instances where two and even four have performed mighty deeds, working in perfect unison, as to time and effort. Probably all these fables have rested upon the wonderful strength of the flea, which being held in captivity by some means exerts herculean efforts to free itself, and these efforts have been used for pulling, drawing, or working some contrivance, so that many have been deceived into believing that the exertion is a voluntary one. It has been reported,

too, in some instances, that the hind legs have been cruelly broken, to give an apparent steadiness of action during an exhibition.

The female flea lays, on an average, from eight to twelve eggs, which are oblong in shape and white in colour, taking some five days to hatch. The flea, as is well known, attaches itself to animals of almost every kind, but in the depositing of her eggs the flea does not, as we should have imagined, attach them to the hair, or wool, or skin of anything; but generally by preference lays them on the ground in some dirty spot. As a rule, a favourite locality is the crevice between the boards, or stones, of some dirty habitation where animal filth of some kind is present. The larvæ are like minute white worms, and are provided with a kind of frontal point, or weapon, which seems to have been given for the purpose of enabling them to break the shell of the egg when the time comes for their exodus. They have no feet, but are provided with two small hooks at the tail, also short antennæ and mouth organs at the head. They are very active, and feed

upon animal substances. When they have been in this larval state for about twelve days, they form a little silky cocoon and rest, when after another fourteen days the perfect flea issues forth ready for work.

In Great Britain there are about seventeen different species of fleas, differing slightly in size and colouring, and varying, too, in the places they inhabit, and the animals which they infest. The "Chigoe" or "Jigger" of the West Indies and South America, is a type of this insect which is much dreaded. It works its way on to some part of the human body, and most often to the feet, sometimes getting underneath the toe-nail. The insect, after getting into position, will deposit eggs there, and unless quickly removed, will cause violent irritation, succeeded by ulceration and poisoning which has not infrequently resulted in terrible suffering and subsequent death.

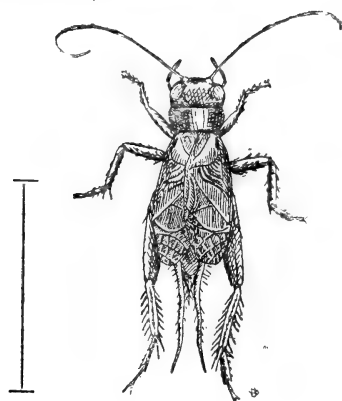
That even the most cleanly people are caused annoyance, sometimes, by the presence of a flea on their persons is an undeniable fact, but, nevertheless, the

truth is that the whole life history of the flea is mixed up with the presence of dirt. The cleaner the person, the cleaner the bedclothes, the cleaner the house, the more scarce will the "pulex irritans" be. Has the flea really a use? Yes. Although I cannot claim that my illustration is original, it has a very distinct work to do. We should all be acquainted with the fact that our body is covered with a fine and wonderfully constructed cover which we call skin. This is connected closely with the nerve centres and blood-vessels of the body. In its turn again this finer skin is covered by an outer skin called the epidermis, which, Nature has ordered, shall for obvious reasons be kept clean by the use of something that shall remove all the dirt, dust and other deposits which accumulate upon its surface, and thus block and choke up the minute pores, or little orifices, by which the air should circulate. Little flakes of dead skin, even the dried up moisture which exudes from our bodies in the form of sweat, may serve to effectually bar the passage of sweet air through these channels. Water (in these days with the

addition, too, of soap) is the natural means which man turns to, or ought to turn to, to cleanse the surface of his body from these impurities so deleterious to his health. But, unfortunately, there is always with us the great body of the unwashed. What of these? Are they simply to die straight away, because of their non-compliance with the laws of Nature? No, the little flea comes along, rejoicing because, on the unwashed personality, he finds a congenial atmosphere and he commences operations. His proboscis, like a microscopic saw, punctures the skin. The individual either jabs, or scratches, with the finger nails the spot attacked, and so unconsciously is doing with his nails what he might have done with water; he clears away from the pores of the skin the dead particles of matter, etc.

The flea is a very troublesome little visitor, very low down—ought not, by common consent, to be even mentioned in good society—but don't say he doesn't earn his daily bread (or his blood). If you want to be rid of him altogether, then you must not only be strictly clean as

far as you yourself are concerned, but your surroundings, your associates, even your pets must be clean. From sweet, clean, sanitary conditions, the dreaded flea will really—flee.



THE CRICKET

THE CRICKET

THE Cricket ("achetidæ")—a genus of insects belonging to the order "orthoptera," or straight winged, and to the section of that order known as "saltatoria," which besides crickets includes grasshoppers and locusts, all of which class can jump or leap by reason of their hind legs being more developed and both stronger and longer than the others. These insects have long slender antennæ. The wings and wing covers are kept in a horizontal position while at rest, and in the case of the male extend a considerable distance beyond the extremity of the body.

The elytra or wing cases are in the male cricket fitted with a kind of grating arrangement, so that when rubbed together the

well-known "chirp" of the cricket is produced; this noise is emitted by the males only and is generally regarded as a rallying call to the female insects. The abdomen of the female cricket is provided with a long augur or ovipositor with which she deposits her eggs, in cracks and crevices in the soil. These eggs are laid during the middle of the summer, and may be anything in number from 200 to 300. The larvæ pass the winter in their larval or grub state, and do not become perfected insects until the following summer. There are several species of crickets—the "*acheta campestris*" or field cricket, and the "*acheta domestica*" or house cricket, this species being the best known.

The field cricket is larger than the better-known house species, and is darker in colour. It burrows some six or eight inches underground and remains there during the day, while at night it wanders abroad in search of food, the male insect often being visible at the entrance to the hole where it will sit for hours chirping—the least disturbance causing the timid little musician to cease his curious notes.

The larvæ which are very like the perfected insect, except that they have no wings, form little burrows for themselves in which they hibernate.

HOUSE CRICKET.—The house cricket is perhaps the form of cricket in which we are most interested, since it enters our houses it forces itself upon our observation. It is of a greyish yellow, almost ashy colour. It generally enters country houses and prefers the kitchen regions—bakers' shops, lime kilns—anywhere where there are regular fires kept going. It finds its way between bricks and stones or loose cement till it burrows within a few inches of an oven or stove, or hot water pipe. In new houses it finds special facilities for working in the undried mortar. The immense amount of heat that these little insects are able to stand, and apparently enjoy, has surprised many. If fires are withdrawn, the cricket becomes for the time being dormant. It is not surprising that from the nature of the cricket's hot, dry surroundings it needs a considerable amount of moisture, and generally likes a place where it is able, when it wishes, to

slake its thirst. This fact is easily proved by placing a vessel of water or anything damp near their burrows, and flashing a light upon them or stealing quietly to the spot, late at night, after lights have been put out. Many people are in the habit of placing damp woollen goods near a fire to dry during the night, and their amazement is great, especially in the case of stockings, when they see large holes in them.

DESTRUCTIVE.—The cricket is most destructive of damp wool, though he does not by any means pass by dry goods. Quite recently I was shown some pairs of stockings which had been placed near a hot water cylinder to air. The owner thought that there had been an invasion of mice, but I knew that there was a cricket encampment close at hand, and that the result, which made the stockings look as if they had been riddled with grape shot, was caused by these mischievous little intruders. To some people the chirruping song is very soothing, and there is superstitious veneration of the cricket, it being considered lucky to have them in the house ; while to others the noise is a cause

of irritation. There are also a considerable number of people who cannot hear them at all though they may chirp quite loudly. It is not a difficult matter to remove crickets by finding their exit, the particular crack or crevice leading to the burrow, and holding a very bright light close to it. The insect will generally find its way out to the light (the gas or lamp in the room having been extinguished or lowered); it can then be caught and either carried in your hand or in a box and safely deposited in some spot at a distance from your dwelling-place.

DESTRUCTION.—To destroy them is both cruel and unnecessary. Personally, I like the music and spare the annoyance of having my socks made into mincemeat by keeping them out of Mr. Cricket's way. In the summer time the fireside is forsaken, except by the younger generation, and the more matured insect takes to an outdoor life. His menu in winter consists of bread-crumbs and other refuse to be found in kitchens, so that the cook who complains of being annoyed with his incessant song may be reminded that he shares the labours

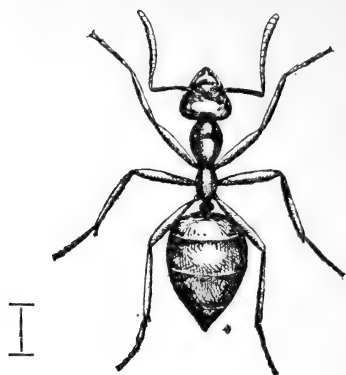
of the kitchen by working hard to clean up while she is in bed. Perhaps some of the hard-hearted will feel more lenient when reminded that the shrill call is a mating, sweethearting, sentimental call, the soft sweet cooing note often meaning that the lady love has been discovered and is being gently smoothed by his long antennæ.

MOLE CRICKET.—A smaller cricket is also met with in woods, and is generally termed the wood cricket, while there is another species known as the mole cricket, so called from the remarkable traits which it develops in common with the mole. It burrows in the ground by means of its front legs, which are peculiarly adapted for the process. Generally it works in sandy, gritty, or loose soil, as being more easily overcome. Like the mole, it works first downwards, and then sends out a number of horizontal galleries. As these galleries are only a little distance beneath the surface it necessarily comes about that roots and tender shoots of plants are destroyed. The insect also preys upon a number of these. A little chamber is

prepared somewhat near the surface of the ground, sufficiently near for the warmth of the sun to be powerful, and here the female deposits her eggs.

In addition to roots, the mole cricket feeds upon insects of different kinds, occasionally becoming cannibalistic in its tendencies. It is very fierce in its temperament, and if a straw or blade of grass be pushed down its hole it will seize it, and can often be dragged in this way from its hiding place, as it holds tenaciously to whatever it has seized. It is evident that Leigh Hunt appreciated the little cricket and his far-famed song, for he says in his poem, "The Grasshopper and the Cricket"—

"O sweet and tiny cousins that belong,
One to the fields, the other to the hearth,
Both have your sunshine: both though small are
strong.
To sing in thoughtful ears this natural song—
Indoors and out, summer and winter, mirth."



THE ANT

THE ANT

THE Ant ("Formica"), as found in this country and Europe generally, belongs to the order of "Hymenoptera," a family which includes bees, wasps, hornets, etc. These little insects are sufficiently interesting as to call forth comment from Solomon, Aristotle, and Pliny, while the volumes written by naturalists upon the ant are numberless. Confusion between the various species peculiar to Great Britain and many larger foreign kinds, added to gross exaggeration as to the powers and intelligence of the insect, have combined to invest ants, clever as they undoubtedly are, with capabilities prodigious. Like other hymenopteræ, ants live in communities, which consist of males, females,

and neuters. They undergo, too, a complete change or metamorphosis, beginning with the egg, then the grub, then the pupa, enclosed in its case, and finally the perfected insect. The males and females are winged, being produced during a portion of the year in large numbers. The male ant retains his wings, while the female loses hers after pairing.

During the summer months the males and females leave the nest for their "nuptial flight" in the air. During this flight the females become impregnated. The male ant then dies, while after impregnation the female loses her wings, and finding her way to some new situation, sets to work to found a new colony, becoming a "queen," or mother. It is highly probable that with ants, as in the case of bees, sexual differences are brought about by the variation of food while in the larval state, the neuter being simply an undeveloped female. These neuters may be sub-divided into two classes. There are those which are literally the hewers of wood and drawers of water, *i.e.*, those which build, repair, feed, nurse, etc., etc., and those

which defend the colony, and so have earned the title of "soldiers." In addition to other peculiarities, these defenders are provided with formidable mandibles, or jaw parts, suited either for defence or offence.

FOOD OF ANTS.—It is as difficult to say exactly what the ant eats as to say precisely what it does not eat. A large number of species are carnivorous or flesh eating, and will readily consume any form of meat from a dead insect to the carcass of any large beast. They are particularly fond of anything sweet, and will travel long distances to procure the secretion of aphides or blight flies, which in the form of honeydew they will lick up from the leaves on which it is deposited, or consume it straight from the ducts of the fly, while in the act of secreting. Ants are often found, too, helping themselves to the nectar of certain sweet-producing flowers, while their predilection for choice ripe fruit is but too clearly observable.

The nest of the ant varies very much according to the species. Vegetable matter, including the "needles" of pine

trees, earth, clay, etc., etc., are made use of, while the outward form or structure likewise varies. Frequently there is a considerable-sized mound or "ant hill"; at other times a small one, in which the intricate parts are below the level of the ground. Sometimes an old tree is made use of, or a wall or the roof of a dwelling-place. If these nests are cut into sectionally, it will often be discovered that the interior varies between one nest and another quite as much as do the externals. Apparently the aim and object of all is the same, viz., the protection of the larvæ from climatic and other risks. The interior shows a number of stories connected by corridors, and the hard-working neuters may be seen inside just as we see them outside, when disturbed, carrying the precious larvæ from place to place. When the sun's rays are pouring upon the nest the larvæ are brought near to the surface that they may get the benefit of the warmth. When it becomes colder these are removed to a lower story. These inner recesses are also used when there is danger from an outside enemy.

ANTS' NEST.—The ant is either a very hospitable and accommodating insect or he has deep reasons behind his apparent hospitality that we know not of, but in examining an ants' nest you will not infrequently find other insects apparently enjoying the warmth and security of his abode. Sometimes aphides, which not improbably enter at a certain time in the year to hibernate, and perhaps the ant, mindful of her good services during the time of the honey-dew season, reciprocates her kindness by affording her a haven of refuge. Woodlice are often found with the ants, looking quite at home, as well as a number of smaller forms of insect life. In foreign countries, where abide larger ants, other proportionately large friends are accommodated in the ant home. Ants are possessed like bees of both compound and simple eyes, enabling them to see perfectly both in the light as well as in the dark. They are known to have also well developed the sense of smell.

The female as well as the neuter is possessed of a sting, an organ which the male insect does not possess. Among

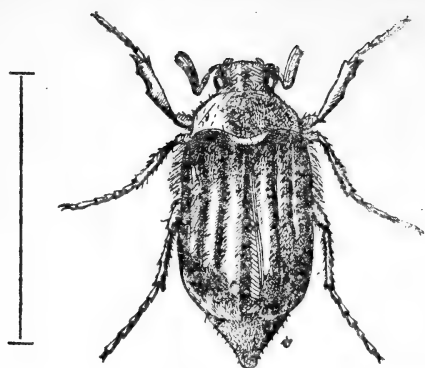
certain ants of foreign kinds regular raids are made upon the dwelling-places of other species, the pupæ of which are carried off. My attention has been drawn more than once to a large migration of ants among our own familiar kinds. On one occasion the body of ants, quite compact in their formation, measured over six feet in length and quite three feet in breadth. On examination of their old dwelling-place and the numbers still remaining behind, it was evident that it was no military expedition, but simply a large body going off, as do the bees at swarming time, to found a new colony. Since then I have not infrequently observed the same thing happening, though the size of the formation has generally been smaller.

CARE FOR THE YOUNG.—As in all forms of insect life, the actions of the ants are ascribed simply to instinct or mental impulse; but call it by what name you will, there are several points about the ant which are distinctly worthy of notice. Amongst others, great solicitude for the young. The way in which the helpless miniature insect is succoured and tended

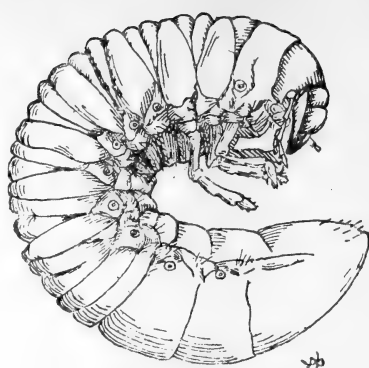
by its willing nurses is remarkable. The same solicitude may be seen in instances where the young of other tribes have been captured by a body of ants. That ants are easily tamed to a certain degree is an established fact. I have seen a window-ledge where the little insects have been fed regularly, the ledge itself being one of their pathways leading from a nest to a neighbouring shrub, to which they were paying special attention. Small colonies of ants with a queen may be even purchased now in some naturalist shops for observation purposes. These may be very simply made, by using the glass covered section cases sold, containing candy for bee feeding, care being taken that some portion is made to slide back that the captives may be supplied with sugar or honey and a little moisture. The way in which the poor little prisoners set to work immediately to excavate roadways and to go on with their ceaseless nursing is miraculous.

The stories about the ants laying up stores for the winter is based upon misconception. In warm countries this is done by some species, but in this country,

with the return of cold the ant at once hibernates, and does not re-commence his activities until the return of the warm weather. At times, too, the eggs and larvæ have by the inexperienced been mistaken for seeds or grains of corn, and wrong conclusions have been arrived at. The white ants or termites, about which much has been told by writers and travellers, resemble the true ants in that they live a community life, but differ from the true ant in that the young do not go through the complete change which the immature hymenopteræ experience. The young termites, in their larval and pupal state, resemble the parent insect. These termites, while found in most tropical countries of the world, are found in greater numbers in South America.



THE COCKCHAFER



COCKCHAFER LARVA

THE COCKCHAFER

THE Cockchafer ("*melolontha vulgaris*") attracts to itself a considerable amount of attention on account of its size, occasionally claiming notice by inadvertently flying in your face, when you chance to cross its line of flight. The cockchafer, May-bug or May-beetle, as it is variously called, is not generally looked upon with any very great amount of love in the agricultural world, as he and his family are credited with doing dreadful damage to foliage and crops. One fact that is often lost sight of is that the cockchafer is dependent, as far as this country is concerned, upon the weather. For several years past there have not been so many seen on the wing as was the case in the year 1912; and

again, though this aspect is overlooked, while there are plenty of specimens which reside and multiply in England, great numbers are migratory.

AN INVASION.—In 1897 I was staying in the extreme end of the county of Cornwall, near the Land's End, when a swarm of cockchafers from over the Channel paid that district a visit. Whether the swarm were resting there before going elsewhere, or whether a storm had overtaken them, I cannot say, but for their purpose the district was most unfortunate—barren, sterile and destitute of trees, there was little for them to feed upon. They poured down the chimneys, smothered the carpets, covered the table, and on many occasions I had to pull the bed to pieces to pick them out before retiring.

In 1688 a district of Ireland was quite devastated by them. The story of this visitation reads almost like a locust invasion. The reports of their noise, the darkness caused by their vast numbers and their destruction are sensational in the extreme.

DIET.—They do not seem to be at all

particular as to diet, which is all of a vegetarian nature. The oak, poplar, beech, elm, fruit trees, black thorn, the garden rose, and wheat, they have been found feeding upon. They have apparently been well equipped for their work upon the trees by being provided with insatiable appetites, and very strong mandibles, to say nothing of the hook with which the forelegs are armed, which enables them to cling with great tenacity to any object which they wish.

Fortunately, however, the duration of the cockchafer's visit, indeed of its life, is very short. We have hardly begun to grumble about its depredations before it is gone as far as the upper world is concerned, though it does reappear in another form elsewhere ; but knowledge of insect life is scant, and few care to observe things which, though thought small and insignificant because they belong to small creatures, are nevertheless forces to be reckoned with, as the farmer sometimes finds to his cost.

After the pairing or mating has taken place, the male cockchafers perish. The

females go some six inches below the surface of the ground, generally seeking loose soil and making use of the hook in the foreleg for drawing herself down, and when a suitable place has been found deposits her eggs, which vary considerably in number, some authorities stating that she lays 200, while others say thirty. More probably an average of from forty to sixty is about correct. In about fourteen days these eggs hatch out into white grubs, thick and fleshy, which have three pairs of legs, and are provided with strong mandibles or jaw parts. When at rest the larvæ maintain a curled-up position.

The cockchafer remains in a larval condition for the space of some three years, and at the end of this period it assumes its pupa or chrysalis form, and after some three or four months gradually emerges as the perfect cockchafer.

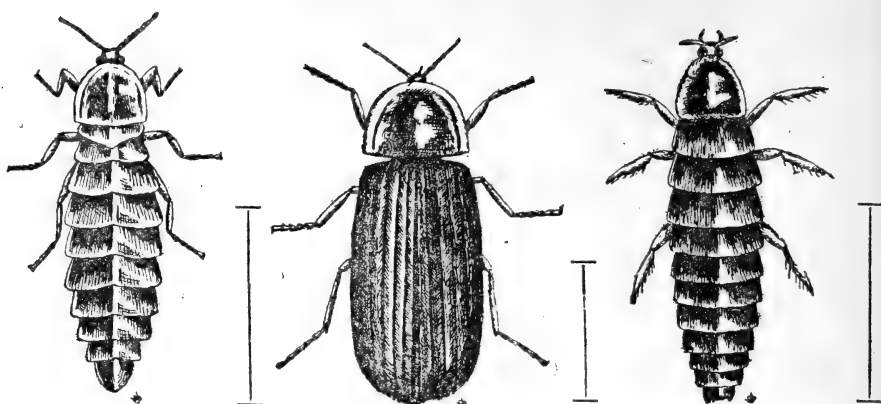
VORACIOUS PESTS.—In the larval state they are very busy upon the roots of different plants, and so voracious are they that unless checked they are capable of destroying alike both cornfields and grass crops. Unfortunate it is, too, that the soft flabby

little larvæ prefer well-tilled ground to that which is neglected and hard. The more it has been ploughed or dug, so much the more easily can he pursue his course of ravage and destruction. Many almost laughable suggestions have been made by agricultural authorities, such as shaking the cockchafer off bushes and trees and picking them off where seen and destroying them. As the cockchafer is particularly fond of elms and beeches, and generally in the day time is found on the underside leaves, not to mention the prodigious numbers of these insects, the suggested remedy is nothing if not puerile.

FOOD FOR BIRDS, ETC.—A county club which has been formed in one part for the destruction of starlings and crows will help on the cockchafer community immensely. Huge numbers of the larvæ are destroyed every day by these birds, especially by crows, which are ruthlessly shot in many districts because of “the harm they do.” The mature insect itself is much sought after by some birds, and it may have escaped the notice of readers that during the month of May, when the cockchafer

is busy, though he mostly confines his flights to the late evening time he often will be seen crawling rather helplessly about the hedgerows, banks and lawns, as if either he had been injured or had lost his way the previous night. These are most readily eaten by a great variety of animals—foxes will seek them, pigs devour them greedily, some dogs eat them, while many cats seize them and, hardly waiting to crush the hard wing cases, swallow them up with avidity. Fowls will not often let go an opportunity to pick one up.

In all probability, if we looked into this matter we should find that either the cockchafer has a medicinal virtue or a pleasing and alluring flavour, and also we observe that it is free from any kind of poison or pungent odour as a means of defence, or it would not be acceptable as a food to so wide a range of creatures.



LARVA

GLOW-WORM (MALE)

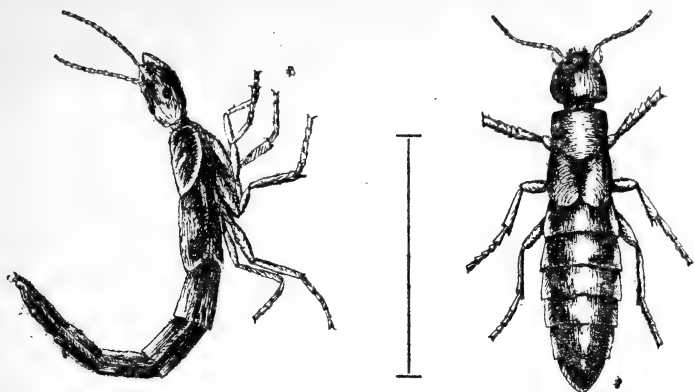
(FEMALE)

THE GLOW-WORM

THE Glow-worm ("Lampyridae") is in reality a beetle and is so called on account of the little lamp which it seems to carry—a peculiar phosphorescent light which is emitted by the female. The male has fairly large wings and wing cases and can fly swiftly, but the female is wingless and has a grub-like appearance, she is sluggish in her movements and nocturnal in her habits. The peculiar light which the female gives out is a means of showing the male, who is generally hidden away during the day, the whereabouts of his mate. The body of the female is divided into a number of segments, and it is the three last of these segments which emit the light, while they are also of a lighter hue than

the rest of the body and would seem to indicate by their colouring that portion of the body which is luminous. The luminous property of the glow-worm is quite under its control, as it is able, when disturbed or alarmed, to extinguish the light in a moment, though they will not always do so even when picked up. I have carried them sometimes in the palm of my hand for quite a long distance, while the light has been kept fully burning. It is often taken as a sign of rain when many of these little luminous patches are to be seen in the hedgerows and banks. Their cousins, the fire flies, are as a rule most brilliant when a storm is coming. On one occasion abroad, I saw a whole country side rendered quite light with numberless fire flies, and this display was succeeded by twelve hours of torrential rain. To a degree the eggs, larvæ and pupæ, resemble the female, in that they have a slight luminosity, while even in the case of the male beetle, the faintest light may sometimes be seen. In the larval state these insects are most useful. They possess very strong mandibles or jaws, and are

greedy little destroyers of the small forms of slugs and snails, especially the latter. As they reach the matured state of the perfected insect they change their diet and become vegetarians or entirely herbivorous, and feed upon the young shoots and leaves of various plants. While common enough during the summer months in the roadside, these insects are altogether too rare in our gardens, and possibly the plainness, we may almost say ugliness, of the female has caused the inexperienced gardener to classify her among "them there insect vermin" which must be put an end to. Could he but see the menu of the larval glow-worm he would change his old views very quickly.



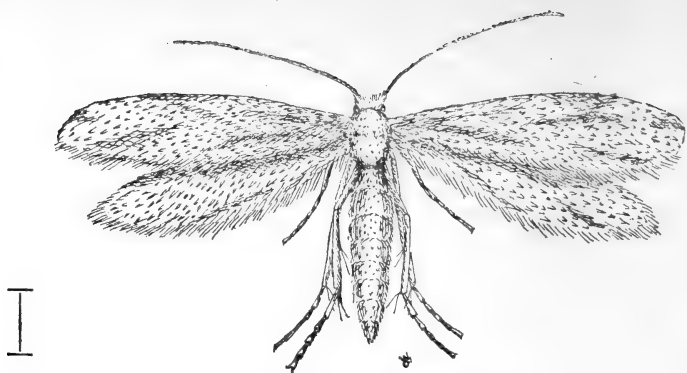
THE DEVIL'S COACH HORSE

THE DEVIL'S COACH HORSE

THE Devil's Coach Horse or cocktail beetle or rove beetle ("staphylinidae") is dreadfully "misunderstood"—and perhaps, to a great extent, has himself to blame. He is so very short tempered and so highly pugilistic, always ready to pick a quarrel with anybody and everybody he meets; and his scorpion-like attitude has caused many human beings, who do not know him, to assume that he must be very dangerous, and possibly poisonous. He is generally about an inch in length, of a dull black colour, with short elytra or wing cases. and may be seen very frequently during the summer months on the beds in the

garden or crossing the paths. Let him alone and he is very ordinary, but interfere with him or obstruct his path and he becomes very extraordinary in his attitude. Up goes the head, the formidable jaws are opened wide and the tail is raised and thrown back scorpion fashion, protruding some small vesicles which emit a fluid capable of giving off a very objectionable odour. Being thus armed fore and aft this creature is capable of doing grievous bodily harm to other beetles or insects which it meets. If you pick up a specimen or bar its progress with your finger, the attempts which it makes to bite you are ludicrous. Both the smallness of its jaw and the violence of its temper seem to render its attempts futile. If one cocktail is placed in the path of another a fight will often ensue, and it is generally "to the death." The egg laid by these beetles is credited with being the largest laid by any British insect, measuring nearly 2 millimetres long by 1·3 millimetres wide. Those formidable jaws which we have pictured as hurling to death and destruction its enemies are also extremely useful. The

Devil's Coach Horse is certainly a friend that we do well to cultivate in our gardens. Once overcome your prejudice and dislike of his exterior, you will discover that you have here a useful ally. He is almost entirely carnivorous and feeds on insects and blight of different kinds, his powerful jaws making him more than a match for insects as large and larger than himself. Thus he will attack large caterpillars which are ruining your cabbage plants. He certainly ranks with the ladybird and other helpmeets which the gardener should always be on friendly terms with. It is of interest to note that there are a number of different species of this beetle, and in some the odour which they emit, on being disturbed or frightened, is not offensive, but on the other hand of a pleasing and delicate nature.



THE CLOTHES MOTH

THE CLOTHES MOTH

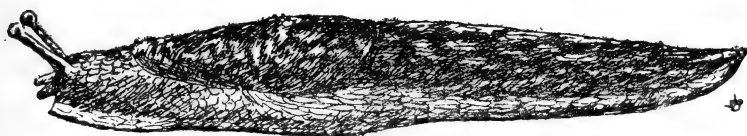
THE Clothes Moth or Woollen Moth ("Tinea Tapezana") cannot, beautiful as it is, claim to be regarded with any great affection. With its fine antennæ, its pretty mottled wings and finely tapered body, there is surely nothing very harmful in this graceful little specimen which can both run and fly at such a rate as often to make its capture very difficult. How we pity it often when such a marvellously conceived and constructed little creature has all its beauty spoiled in a moment by burning itself, as it so constantly does, in the flame of the candle. No, the moth in itself is innocent, but for the naughty little habit which the female has of getting into drawers, wardrobes, and cupboards, and

searching out clothes, blankets or any woollen garments and there depositing her eggs. These hatch out and a little caterpillar or grub appears, which is of a glossy, white colour, with a greyish line upon its back, and a few hairs sprinkled here and there over its body. When launched into the world it wastes but little time and begins almost at once to clothe itself in the warmest of woollen garments, leaving behind it a bare little path running in all directions. It really starts first by spinning a few filaments of silk round its body, as if to afford a particularly soft lining, and then proceeds to thicken this and to add to its bulk by gnawing off the fine ends of the wool and thus rendering threadbare and riddled the portions upon which it has been at work. This sheath or tube which it makes for itself, it seldom or never leaves. These cocoons are wonderfully made since the fine threads of the substances which they shear down by means of their powerful scissor-like little jaws, are fastened together by a glutinous secretion. The little grubs increase in size, and from time to time

find their dwelling-place too cramped. They then proceed to split their covering down the middle and interpose a new piece according to their needs, sometimes adding a piece at the anterior end, if it is length rather than breadth which they require. This addition to the size of the sheath can be seen quite readily, without the use of a magnifying glass, by simply transferring the grub from material of one colour to material of another, when the additions will be easily observable from the difference in colour. The thickness of covering which the grubs make use of varies also in thickness according to the material from which he builds his woolly house. The grubs of the wax moth, whose habits are very much the same, will sometimes cover themselves in in very much the same manner, while nothing is visible from which they can weave a covering, while traversing a sheet of wax. The wool, in addition to supplying a covering to the grub, also furnishes it with food at the same time. When the larva has attained its full size its appetite begins to fail and all food is gradually abandoned,

and creeping upwards, often to the ceiling, suspends itself from some projection in an angle of the wall, and the larva becomes a chrysalis. In this form it will remain dormant for some twenty-one days, at the end of which period the small silver-grey moth issues forth. While this moth is generally called, by common consent, "the Clothes Moth," it must not be thought for one moment that woollen goods alone are attacked. Furs, hair, feathers and many other materials are destroyed by them. The Ashmolean Museum at Oxford lost the finest specimen of the Dodo which existed, through the destructive powers of these little insects. There is one great point, however, that must be told in favour of the Clothes Moth, for she sadly needs all the extenuating circumstances which we can bring forward. She selects material in which to deposit her eggs which has been cast aside or stored, not that which is regularly being used or worn. She is, too, a most useful agent in Nature for clearing away old, unsightly rubbish, such as sheep's wool, which, in some districts, is seen so often attaching

itself to bushes and shrubs in the hedgerow. She helps to clear away the numberless old birds' nests which, when finished with, make the hedges unsightly, and perhaps, when you come to think the matter out, her mission to us in our homes is to make us less vain by destroying superfluous wardrobes, and less selfish and miserly by rendering useless things which we are only hoarding, things which might have been of priceless value to someone else.



THE SLUG

THE SLUG

THE Slug ("Limax Agrestis") is a name which is applied popularly to this branch of the molluscous animals (not insects). They are to be found in greater quantities than snails, and are said to be greatly on the increase in this country as a result of the milder winters which we have experienced for a number of years. There are quite a number of different kinds and sizes of slugs to be found in our fields and gardens. Especially noticeable are the large ones, "Limax Cinereus," or the large grey slug and the black slug ("arion"). It is generally thought that the difference between snails and slugs is that the former have shells while the latter are without. This theory is, however, incorrect as most slugs have

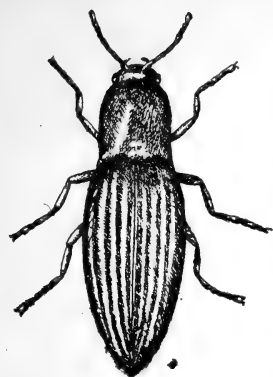
a shell, though a thin and delicate one, which is hidden beneath an outer covering of skin. If the raised part or "mantle" of the slug is carefully removed with a fine, sharp knife, the shell will be found beneath, quite rudimentary, it is true, when compared to that of the snail, but still it can be removed and dried for purposes of examination. The body of the slug, elongated in shape, carries a distinct head with four tentacles, the upper pair of which carry the eyes. Both the tentacles and the head are provided with muscles which enable them to be withdrawn quickly, and when alarmed the animal will withdraw these beneath its "mantle." The creeping disc extends the whole length of the animal and acts as the surface of the foot, secreting a slimy mucus which helps greatly its means of locomotion. On wet evenings, or after rain has fallen, these creatures are found in much larger numbers, as the moisture on the surface of the ground makes it easier for them to travel. Although the slug is possessed of eyes it would seem to be more sensitive to the slightest touch than the brightest light. I have gone

out "slugging" on many occasions late in the evening armed with a brilliant acetylene light, the rays of which, fail apparently to alarm the slug in the least degree, whereas the slightest touch either on themselves or anything in close proximity at once causes them to withdraw the head. The slug has a famous appetite, and many of us can remember to our sorrow, some pansy, sweetwilliams, or perhaps some rarer flower or even fruit that has been ruined, with but a slimy trail left behind to tell the tale of the spoiler's identity. Owing to their tendency to hide themselves during their period of hibernation, in all sorts of out of the way places, coupled with their nocturnal habits, slugs are very difficult to eradicate from a garden. Everything which produces a dry powdery surface, such as soot and lime, makes it difficult for slugs to travel, and so in a measure keeps them away from flower and vegetable beds, while they may easily be trapped by means of orange peel, banana skins or slices of vegetables, such as carrot and turnip. A narrow slat will induce slugs to crawl upon its

under side where they may be easily caught. A leaf of a plant plucked off and laid alongside a living leaf will often save the latter, dead or withered food being always preferred.

Although the slug is by nature a vegetarian, he may, if deprived of his natural diet, become a cannibal. If a number of slugs are placed in captivity, and there is a shortage of food, the strongest only will survive, till probably only one will be seen, the others in turn having all been gradually eaten up. If a few ducks are turned into the garden after rain, they will be found excellent slug exterminators and will do but little harm to the plants, if any at all. When catching slugs the easiest and most humane way of dispatching them is by dropping them into a vessel containing a strong solution of salt.

The eggs of the slug are very plentiful and are soft and semi-transparent, smaller and more oval than those of the snail. They are deposited in clusters at the roots of grasses and shrubs.



THE CLICK-BEETLE

THE WIRE-WORM

THE WIRE-WORM

WITHIN but a few hundred yards of where I sit writing, there is situated a large ploughed field. How often have I admired the patience with which the farmer goes up and down, with what seems to me an endless monotony as he drives the ploughshare into the soil, and thus, and with many another process, prepares for the final harvest. I watched him recently as he carefully sowed the seed and then—what? Not a field covered with beautiful regular lines of bright verdant wheat; precious little of anything at all. The whole crop had been destroyed by a small insignificant little villain called the wire-worm, one single specimen of which can do a lot of harm, but when allied with large numbers of his species, becomes truly a terrible pest. If it is any consolation to

the poor, long-suffering farmer, we may tell him at once that if he were to travel almost everywhere in this world where crops are raised or gardens are planted, he will find some relation of this numerous family at work. In America as well as in Old England, every scientific device has been brought to bear upon the subject of the wire-worm, and every effort made to counteract the harm he does, with but a small measure of success. The Click beetles ("Elateridæ") are the parents of the wire-worms, and are so called from a peculiar habit which they have of snapping their bodies on springing upwards, which action they are enabled to accomplish, not by means of their legs, as in the case of many kinds of insects, but by the action of the fore part of their bodies acting upon a specially provided and peculiar structure. The adult click beetle is generally about half an inch long, somewhat flattened, short in the head with a shield-shaped thorax, and in colour of a darkish brown. They seem, unfortunately, like many troublesome creatures to multiply very rapidly, but a favourite spot with

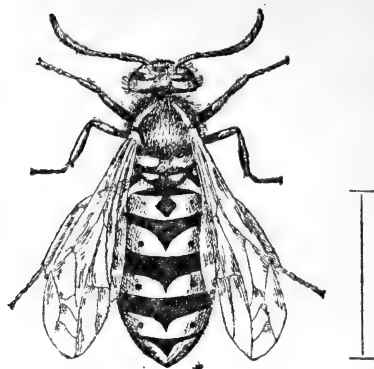
them is land which for several years has been laid down in grass, while that which lies low and is badly drained or inclined to be moist will suit best. In such a spot as this Mrs. Click Beetle will deposit her eggs in the ground, which in a short time will develop into yellowish-brown or reddish wire-like grubs with six legs on the first three segments and a small prominence on the last segment. Now if these little grubs were the creatures of a day, a week, a month or even a year, we should not worry so much about them, and probably they would not in their turn worry us as they do; but unfortunately they are long lived, for they take from three to five years to become full grown, and during the greater part of that time they gnaw away at the roots of plants and commit wholesale acts of destruction. The larvæ attain the full growth during the summer months, and having curiously formed a small house or cell from the earth in which they live, they enter it and are there transformed into the pupæ. Three or four weeks later the adult beetles cast off the pupa skin, some coming

to the surface during the autumn, while the larger number, not being perfectly matured or hardened, remain in the pupal cells until the following spring. When about to mature they go deeper into the soil before appearing as the perfect click beetle. The wire-worm and its parents, while common to almost every part of the globe, differs slightly in size, shape and structure in different climates, the Click beetle in some parts of the world being quite luminous, but there is this point in common everywhere—these little subterranean pests are most harmful to crops. Not only does the farmer suffer but the kitchen garden and the flower garden come in for attention. And just as a carefully-kept garden may become a veritable bed of thistles through some immediate neighbour allowing thistles to grow up and seed and cast its thistle-down abroad, so a dirty, ill-drained piece of land may become the breeding place of endless numbers of click beetles which will spread their progeny over a district. It stands to reason that it is far more easy to clear a garden of wire-worms than say a five acre

field. In the garden they may be trapped by placing a slice of carrot, beetroot or potato on the end of a stick, the vegetable being buried while the end of the stick protruding from the ground marks the spot where the trap is placed; while they may be attracted, it is said by some, from more valuable plants, such as carnations and anemonies, by placing daisies in clumps or rows not far away, as the roots of this plant are preferred. It has been too clearly proved that soot, if well mixed with the soil in which seeds are sown, will drive away wire-worms from the vicinity. But to turn to the farmer and to his wider area and more difficult task. He has sown his field and in vain awaits the sprouting of the young shoots. He unearths some of his seed and finds either a round hole drilled through the centre of the wheat or detects the little thief with his head embedded in the corn in the very act of stealing its kernel. If he has already experienced the work of the wire-worm he will not waste any time in re-seeding his field, and possibly then if the new seed gets a start its roots may be stunted by the

worms attacking the roots, and even when several inches high it may yet be destroyed. Grain of every kind is attacked by these destructive little things, perhaps especially wheat, as well, too, as potatoes and turnips. The farmer, the scientist and the experienced entomologist have all done their best. Large sums of money have been spent, grants from agriculturalist societies made, but with little effect. Ploughing late in summer time and keeping the ground stirred as often as possible has perhaps done more than anything else to destroy large numbers of the newly transformed beetles and pupæ. Rolling the ground and thus keeping it very firm will prevent them moving about so quickly in their march of destruction. The growth of mustard seems obnoxious to them, and when the green mustard is ploughed into the soil it has been proved to be, if not altogether a remedy, at least a decided check. A quick rotation of crops, anything which conduces to the disturbance of the soil is good, for not only does this hinder the development of so many of these beetles and their offspring, but it exposes them to

the light of day, and while many are thus, because immature, destroyed by the very act of exposure, they are also readily preyed upon by many birds which are only too ready to snap them up. Unfortunately, the farmer from want of knowledge fails to recognise his best friends. Thus in a field where wire-worms have been particularly busy, I have noticed large flocks of starlings congregating, and even marked the fact that in a spot where the worms were most busy the birds were thickest. The farmer believing that the birds had come to attack his crop comes out armed with his gun and kills scores of these little friends who had come to do him a service. The starling will eat corn, but he much prefers a meat meal, and where he can get at the click beetle and her family, he will not trouble much about a change of diet. When we consider all the damage that these little fellows are capable of doing and how little the brains and wealth of man have been able to accomplish in putting an end to their depredations, we see before us an immense field of opportunity for someone to rise to distinction.



THE WASP

THE WASP

WASPS (“vespidæ”) live like many forms of bees and ants in large communities, made up of males, females and neuters. In the autumn of the year, as the weather becomes cold, all but a number of more recently hatched females die off. These hibernate in hayricks, the thatches of cottages, old trees, or roots. When spring advances, and the rays of the sun increase in warmth, these queens or mother wasps, emerge from their winter hiding places and begin to look round for a likely place for a nest. This is most commonly built in a bank, where either the protruding root of a tree, or an untenanted mouse hole has, so to speak, begun an entrance. The wasp will then clear a little space, possibly no larger than

a small orange. She then proceeds to a tree, post or wooden railing, and begins tearing off small fibrous pieces which she works up with her powerful jaws and which, by the help of a secretion, is constructed into a paper-like substance. You will also notice her settling on the young buds and shoots of certain trees gathering gum or propolis, with which the first portion of the nest is fixed on to something from which it is to depend. A small tier or flattish piece is then built containing a number of hexagonal cells. In each of these an egg is laid, which, in due course, reaches its larval stage—little fleshy grubs, of which the first batch are tended by the queen herself. When full grown a capping is spun by the larvæ over their cells and the pupal state is gradually reached. When the matured wasp, a neuter, emerges from the cell it begins almost at once to work upon the enlarging of the city and carrying on the onerous duties hitherto performed by the queen mother, who now, having begun the nest single handed, does not go out any more, but confines her attention to egg laying. So the process goes on. As

young wasps are hatched out, the nest increases in size. Thus I removed a few years ago from an empty beehive, a wasps' nest with one tiny tier containing about a dozen cells, the whole being no larger than a golf ball, and I have also seen a nest when fully built that could not, without crushing, be got into an average sized bucket. By far the larger number of wasps are abortive females or neuters, but later on in the summer, a number of males are hatched and a goodly number of females. Of the former a few are necessary for mating purposes, and the females, born late in the year, will survive the rigours of winter to begin their rounds as queens in the year following. It cannot be denied that in many ways wasps are a nuisance when over plentiful. What is more aggravating than to find some of our finest specimens of plums, pears, apples, peaches and even grapes spoiled by them—and they know good fruit when they see it ! They will get into the house, and we find them on our tables, in the kitchens, larders, everywhere in fact, but how few remember the debt which we owe them—for all

these excursions, remember, take place during the fruit season, which means late in the year. What millions of blight flies have been previously destroyed by these wasps, for the young are, to a great extent, reared upon blight flies of different kinds. The wasp is not at all particular, and is very fond of meat. Thus the butcher will often find these little thieves stealing tiny portions of his stock. Let the order once go forth that all wasps' nests in any vicinity are to be destroyed, then blight will increase in that district to an extent undreamed of. The young wasps when hatched out do the nursing, building, protecting, procuring, in fact, the whole work connected with the upkeep of their little city. The jaws of the wasp are very hard and horny in their substance, and work laterally or sideways; thus in tearing up substances, biting, or cutting, they are able to use them on hard materials. They are provided with compound eyes, with a large number of lenses, the eyes which you can see, and which enable them to see all around them during their flight, and also with three simple, single eyes, between these, which

probably enable them to see and do their work while in the darkened recesses of their underground home. Its large wings are folded and creased in the centre when the insect is at rest ; while the feelers on the head may possibly be organs of hearing, and are certainly extremely sensitive. The sting of the wasp, while barbed, is not so barbed as that of the bee, and is constantly withdrawn and reinserted many times. I have watched a wasp insert its sting in six different spots on my own arm. There is one thing perhaps more ludicrous than watching a man chasing his own hat down the street in a wind, and that is to see a whole table full of people, who are held up, or imagine they are, by a single wasp. The fact is that wasps, except in protecting their nest, *i.e.*, in its immediate vicinity, seldom use their stings. Accidents will occur, such as a sleepy or chilled wasp crawling up your clothing, eating a piece of fruit previously claimed by a wasp, etc., but these are exceptional cases, and wasps that are hovering round the fruit dish or the sugar basin will not sting. The wasp is particularly affectionate and attentive

in the care of the young, and if the larva or pupa be taken from a nest and placed where adult wasps can approach them, it is quite pathetic to watch the interest evinced, which will sometimes find its climax in the young and immature insects being carried off. If wasps were of any use in the gathering of honey, there is but little doubt they could as easily be handled and subdued as are ordinary bees. I have in my possession a wasps' nest covered with glass, with the whole work of the community proceeding as if they were bees in an ordinary hive. Some years ago, I procured a small wasps' nest and placed it in my green-house. I had the misfortune to lose the queen, but as the young wasps hatched out, the damaged portions of the nest were repaired and I was enabled to watch their wonderful methods. I never knew during the whole time of a single person being stung by the insects as they went in and out of the nest, which I placed in a wooden box. I fed them regularly from my hand and was able to discover of which fruits and sweets they were most fond. Undoubtedly honey was

liked best. Wasps are by no means teetotal in their leanings. They love devotedly a little piece of choice fruit in which slight decay has set in, and which, as a result is alcoholic. They may be seen in a row helplessly drunk, and when recovered will go shamelessly at the same business again. I have utterly failed to introduce a queen from one nest to another, even when a nest has been rendered queenless purposely. It would seem from my own experiments as if a fully matured queen will have nothing to do with a colony, however small, if she has not founded it herself. I have even imprisoned one with a very small nest, only to find her wandering aimlessly by night and day on its outside, and on being released flew away, to be seen no more.

THE END

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